

1,1,2-TRICHLOROETHANE

1,1,2-Trichloroethane is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 79-00-5

$\text{CH}_2\text{ClCHCl}_2$

Molecular Formula: $\text{C}_2\text{H}_3\text{Cl}_3$

1,1,2-Trichloroethane is a nonflammable, colorless liquid that has a characteristic sweet odor. It is insoluble in water and miscible with alcohol, ether, and many other organic liquids (Sax 1987).

Physical Properties of 1,1,2-Trichloroethane

Synonyms: vinyl trichloride; b-trichloroethane; ethane trichloride

Molecular Weight:	133.42
Boiling Point:	113.8 °C
Melting Point:	-36.5 °C
Vapor Density:	1.067 (air = 1)
Density/Specific Gravity:	1.4416 at 20/4 °C (water = 1)
Vapor Pressure:	30.3 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	2.07
Water Solubility:	4,420 mg/l at 20 °C
Conversion Factor:	1 ppm = 5.46 mg/m ³

(Howard, 1990; HSDB, 1991; Merck, 1983; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

1,1,2-Trichloroethane is used in adhesives, in the production of Teflon tubing, in lacquer and coating formulations, as a solvent, and in organic synthesis. It is also used as an intermediate in vinylidene chloride synthesis and as a solvent for chlorinated rubber, fats, oils, resins, and adhesives (HSDB, 1991).

The primary stationary sources that have reported emissions of 1,1,2-trichloroethane in California are manufacturers of fabricated metal products (ARB, 1997b).

B. Emissions

The total emissions of 1,1,2-trichloroethane from stationary sources in California are estimated to be at least 34,000 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

1,1,2-Trichloroethane is not known to occur as a natural product (HSDB, 1991).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of 1,1,2-trichloroethane. However, the United States Environmental Protection Agency (U.S. EPA) has compiled 1990 ambient air data from several urban locations throughout the United States. The mean ambient air concentration was 0.33 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) or 0.06 parts per billion (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of 1,1,2-trichloroethane was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Atmospheric 1,1,2-trichloroethane is expected to degrade by reaction with photochemically produced hydroxyl radicals. Based on the rate constants for its reaction with hydroxyl radicals (see Atkinson, 1994), the half-life is estimated to be about 50 days (Atkinson, 1995). Due to its partial water solubility, 1,1,2-trichloroethane may also be expected to partially washout in rain (Howard, 1990).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of December 1996, for non-cancer health effects, 1,1,2-trichloroethane was not listed in any of the risk assessments (OEHHA, 1996b).

HEALTH EFFECTS

Probable routes of human exposure to 1,1,2-trichloroethane are inhalation and dermal contact (HSDB, 1991).

Non-Cancer: 1,1,2-Trichloroethane is a central nervous system depressant. Inhalation may produce headache, lassitude, dizziness, uncoordination, low blood pressure, irregular heart beat, coma and death from respiratory arrest. Exposure to vapor concentrations near 2,000 parts per million for 5 minutes causes central nervous system depression and anesthetic effects. 1,1,2-Trichloroethane may sensitize the heart to the arrhythmogenic effects of epinephrin. Effects on the liver, kidney, and central nervous system from inhalation and oral exposure have been reported in animal studies (U.S. EPA, 1994a). Individuals with diseases of the liver or kidneys may be at risk from exposure to 1,1,2-trichloroethane (HSDB, 1991).

The Reference Concentration (RfC) for 1,1,2-trichloroethane is under review by the U.S. EPA. The Reference Dose (RfD) for 1,1,2-trichloroethane is 0.004 milligrams per kilogram per day based on clinical serum chemistry in mice. The U.S. EPA estimates that consumption of this dose or less, over an entire lifetime, would not likely result in the occurrence of chronic, non-cancer effects. No information is available on adverse reproductive effects in humans or animals from inhalation or oral exposure (U.S. EPA, 1994a).

Cancer: No studies are available regarding cancer in humans from inhalation or oral exposure to 1,1,2-trichloroethane. No animals studies are available on cancer via inhalation exposure. Liver tumors and adrenal tumors in mice, and no tumors in rats, were found in animals treated with 1,1,2-trichloroethane by gavage (U.S. EPA, 1994a).

The U.S. EPA has classified 1,1,2-trichloroethane in Group C: Possible human carcinogen. The U.S. EPA has calculated an inhalation unit risk estimate of 1.6×10^{-5} (microgram per cubic meter)⁻¹. The U.S. EPA estimates that if an individual were to breathe air containing 1,1,2-trichloroethane at $0.06 \mu\text{g}/\text{m}^3$ over an entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified 1,1,2-trichloroethane in Group 3: Not classifiable as to its carcinogenicity in humans (HSDB, 1991).

The State of California under Proposition 65 has determined that 1,1,2-trichloroethane (vinyl trichloride) is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 2.1×10^{-5} (microgram per cubic meter)⁻¹ for 1,1,2-trichloroethane (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of 1,1,2-trichloroethane is estimated to be no greater than 21 in 1 million (OEHHA, 1994).

